Ecological and socio-geographical conditions of pastoral migration in Mongolia

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The traditional nomadic pastoral economy is the main branch of industry in Mongolia. 1,311,000 km² (98% of the agricultural-effective land) of Mongolia's 1,566,500 km² area is pastoral land. In the pasture areas nearly 50 million tons of forage plants are grown annually. There are 30,2 million traditional five types of animal: camel, horse, cow/yak, sheep and goat. 2000 there were 421,392 livestock keepers. An estimated 45% of the population of the country are directly engaged in nomadic livestock keeping(see: appendix).

Generally accepted as a nomadism widely distributed area of the north hemisphere is the area from the tropical and subtropical regions of North Africa, Near Eastern to the continental moderate dry region of the Central Asia/Eastern Mongolian steppes, which is designated in the Geography as the 'Old-World dry belt'. Due to dominant arid and semi-arid conditions of this region the plant production is concentrated solely in restricted favourable areas. However, the wide-range arid and semi-arid areas provide an enormous potential as a pasture for a livestock production. The natural barrenness of the land, its topography and expansive distances demand an optimally adapted and lasting means of use of this pasture potential. Mobile livestock keeping[1] on which the nomadic society is based was emerged as an only possible economic form and is ecologically and economically adapted form that can make use of these special natural conditions. Nomads own herd animals of regional species, for example, sheep, goats, camels, cattle/yak and horses as means of production, and the natural pasture and water as their production condition. In search of food and water for their herds they have to lead depending on different geographic locations a more or lesser migratory way of life.

The migration of nomads is not a chaotic movement at all. Various ecological factors like climatic conditions, availability of forage plants, distribution of salty soils, supply of water, and socio-political framework, have all played a part in seasonal migrations. The effects of all these factors on migrations are connected with seasonal altitudinal conditions. From this fact it follows that seasonal migrations are in principle directed altitudinally (vertically) between the highlands and the lowlands correspondingly combined with planar (horizontal) migrations which livestock keeper often within a season in order to extend the area of pasturage and to increase feed supply.

There are a number of significant factors of influence giving rise to nomadic migration: politics, economics, social anthropology and ethnography. These viewpoints will be considered but the main determinants will be treated from the ecological and socio-geographic point of view. Nomad's seasonal migration within a region which is ecologically optimal for the yearly rotation of pasture land use is broadly characterised from an ecological and socio-geographical aspect by the below dealing with factors. By means of a description of these significant factors and their close correlation it is possible to explain not only the reason for migrations but also the nature of the nomadic lifestyle at all. In this way the particularities and the generalities of Mongolian livestock keeping and of other forms of mobile livestock keeping in the 'Old-World dry belt' can also be understood. Mongolia is one of the few nomadic areas in which true nomadic livestock keeping is of great significance in contrast to other countries in the region.

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[1] The term mobile livestock keeping is used to refer to all regionally specific transitional and mixed forms ranging from true (pure) nomadic economy, semi-nomadic and semi-sedentary pastoralism to sedentary pastoralism.

1. Climatic conditions as a determining factor of seasonal, altitudinally directed migration

The general basis of nomadic livestock keeping in Mongolia, in the high mountains, the forest highlands, the steppes or the Gobi region, is a change of pasture to ecological areas which are climatically favourable in the respective seasons. This means that livestock keepers with their stock must avoid extreme climatic conditions caused by, for example, temperature, storms and precipitation. The effects of temperature (fig. 1), storms (fig. 2) and precipitation on the choice of pasture land are different for each of the four seasons. It is useful to describe the climatically determined choice of pasture for each of the seasons separately.

Winter Livestock keeping in Mongolia is still completely dependent upon climatic conditions, particularly in the hard winter. Migration at the start of winter into a region where temperature, wind and precipitation are relatively favourable for livestock keeping in the cold is inevitable. It is obvious that the average temperatures in the natural zones of Mongolia, in the high mountains, the forest highlands, the steppes and the Gobi region, differ. But even within these zones there are general differences in temperature depending upon orographic factors, i.e. altitude, slope, exposure, and moisture, light and warmth conditions.

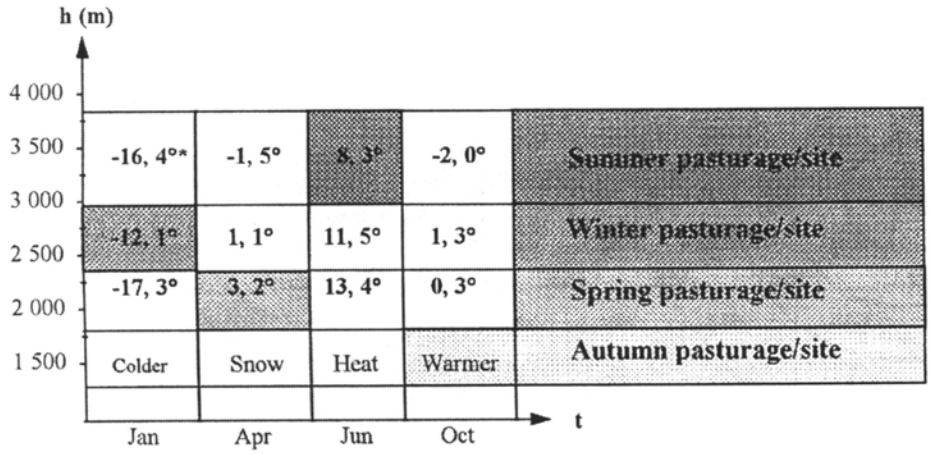
One of the most important reasons for migration to the winter pasturage is the search for the warmest mountain belt. The winter site is thus located at a point in this belt which is most favourable for humans and livestock. Many years of experience of Mongolian nomadic livestock keeping as well as the results of geographic and meteorological research show that the most favourable locations in winter as far as temperature is concerned - relatively independently of the nature zones of Mongolia - lie between the mountain crest and the middle altitudes of the respective regions. These favourable locations in the differing nature zones stand in close connection with the wind conditions, i.e. the wind direction and the wind strength. The most frequent wind directions in Mongolia are westerly and northwesterly. The annual average wind strength is 4-8m/sec. This means that the south side or the south slopes of the mountains are always suitable for the winter as well as the spring pasturage. Livestock keepers as well take into account in which location less snow, as a result of the wind direction, is blown into the winter pasturage. Moreover, the wind strength must be considered in the choice of location, whether it is sufficient to blow away a possible snow covering. According to experience, livestock keepers choose their winter pasturage at a comparatively windy location if snowfall is high, or at a location most sheltered from wind otherwise. This shows that the evaluation of the wind in the choice of the winter pasturage depends a good deal on precipitation. The average annual precipitation for the entire country amounts to 200-250mm. As well the yearly precipitation decreases from north to south from 400mm to 100mm.

The winter pasturage should in no case be carried out in low-lying regions, where snowfalls are higher or snowdrifts can mount. The best pasture sites in winter are therefore those regions which provide a favourable combination of temperature, wind and precipitation for the livestock. Such sites lie in principle in all three nature zones in the belt between the higher and middle mountain ranges. The winter site is therefore located on a higher south slope of a mountain or in a mountain cleft away from the wind direction (figs 1 and 2).

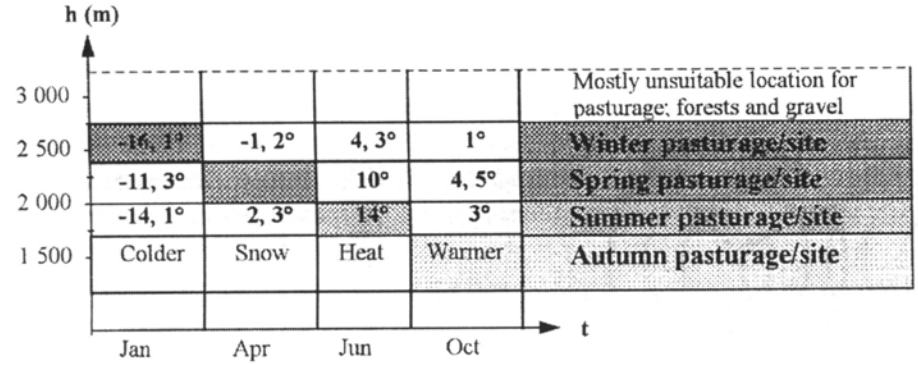
Mongolian livestock keepers not only seek regions protected from the wind according to natural principles but also make use of long-standing wind shelters (Mong. *halha*, *horoo*). These shelters are constructed mostly from local building materials, from wood and stone in the highlands and forest lands, from compacted manure and straw in the steppes, and from stone in the Gobi region.

Winter shelters have been used in Mongolian livestock keeping for a long time to a greater or lesser degree. Autochthonous sources report that there were frequently in the 13th/14th centuries temporary additional shelters. The remains or traces of winter shelters from the 18th/19th centuries can even today be seen in rural areas. Since the end of the fifties, as a consequence of the policy of forced settlement, permanent shelters for winter and spring were intensively built. In 1993 there were in Mongolia about 76,100 shelters in all. Approximately half of these were winter shelters (Mongolian economy ... 1993: 40). Logically, this should have had a positive effect upon the keeping and breeding of the livestock. However, the results were not as expected. It is worthy of mention that before this building of shelters on a massive scale the winter and spring sites were much simpler. Many livestock

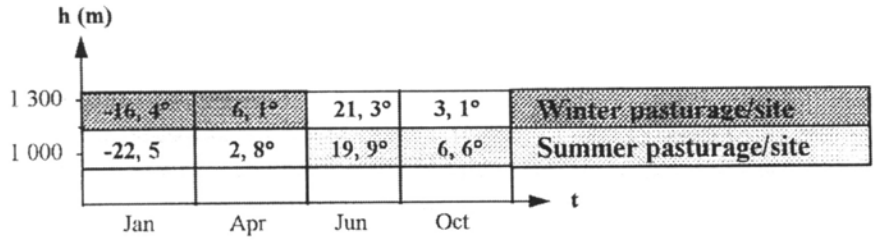
1. In the Altai Mountains: Weather station of the city Altai (46°N, 96°E, altitude 2180 m)



2. In the Hangai Mountains: Weather station of the city Arvaiheer (46°N, 114°E, altitude 1810m)



3. In the Steppes: Weather station of the city Choibalsan (48°N, 104°E, altitude 750 m)



* - t° C

Design: B. Bold

Source: From the statistics of the Research Institute for Climatology and Hydrology, Ulaanbaatar (1985)

Fig. 1. The relation of seasonal migration to altitudinal differences in the air temperature during the seasons

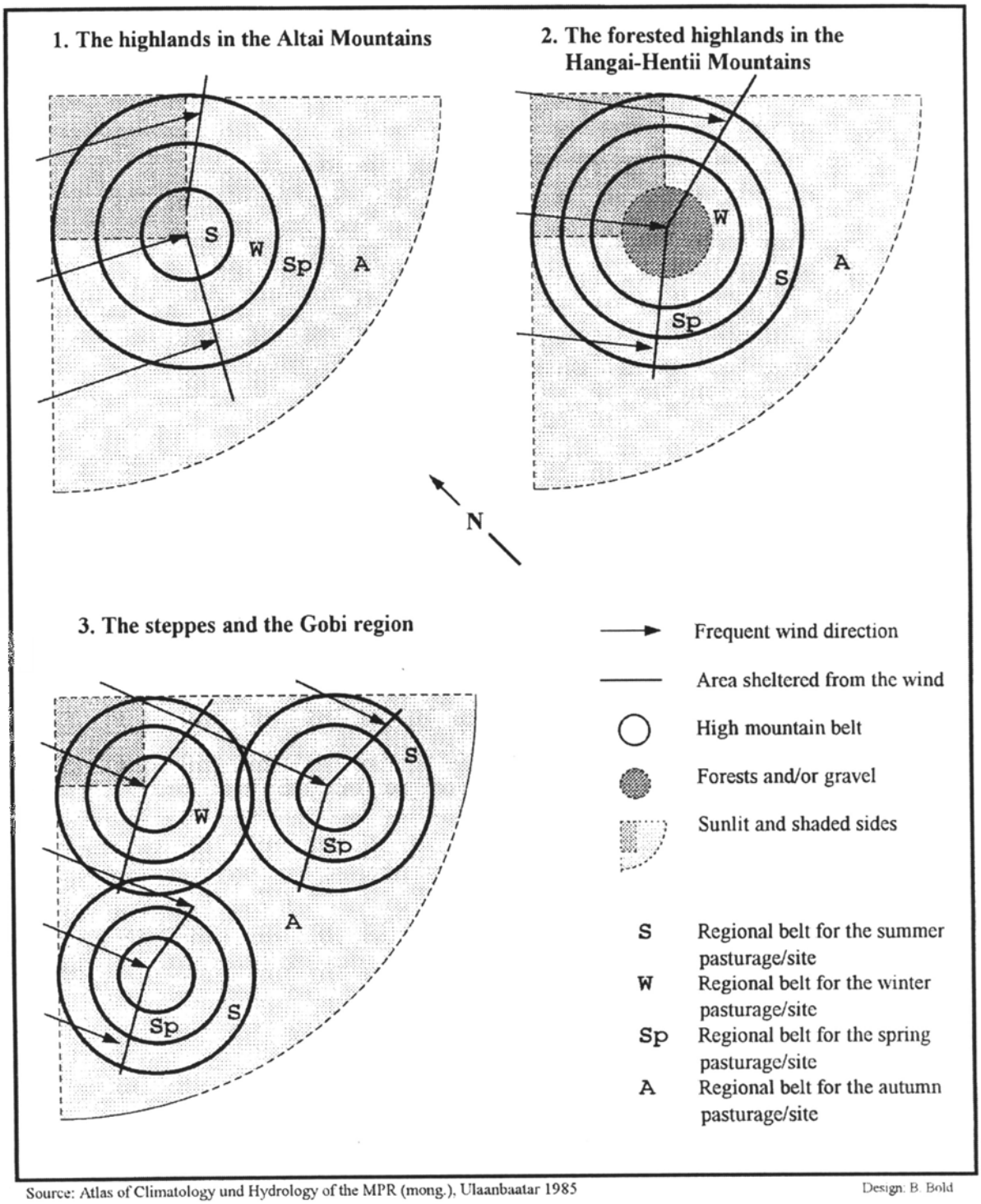


Fig. 2. Suitable locations for seasonal pastural areas and sites according to wind direction and sunlight

keepers do not consider from their experience the stabling of stock as a correct method. In traditional livestock keeping the opinion prevails that with stabling the stock should not be sheltered from the cold but rather from the wind, that is the stables should serve only as a wind shelter. Warm stabling makes the animals perspire, and the effect of a sudden change of temperature on a perspiring animal emerging from a stable accelerates the winter process of emaciation and enervation. In this respect the design of the shelters is of great significance (Shagdarsüren 1984: 68). It would make an interesting comparison to represent loss of stock in connection with the construction of permanent winter shelters.

Spring Approximately from the end of February until the start of May the day temperatures increase in the Central Asian highlands. With the collision of the northerly and northwesterly cold air and the southwesterly dry and warm air, air currents are activated and the wind direction is therefore relatively changeable. This has an effect upon the type of precipitation which frequently changes between snow and rain. The conditions which should be considered for the spring pasturage or site can be described in the following manner:

- a wind sheltered, relatively warm location. This is more important in spring than in the other seasons. From time immemorial Mongolian livestock keepers constructed only temporary wind shelters, provisional stables or mere fencing. In the last three decades however, as mentioned above, many permanent spring stables were built. At the end of the eighties there were in all more than 30,000 spring stables in the country. For the spring pasturage mainly those regions are used which lie in the belts of the lower mountain ranges. The spring pasturage therefore is located somewhat below the winter pasturage on the south face of a mountain between a middle altitude and the mountain foot. Although in general the lower the location the warmer it is (fig. 1), snow often remains at the mountain foot and in the lowlands until May, and nights can be cold and damp.

- places situated away from lakes, morasses, gorges etc.: in the windy spring the animals move frequently along the wind direction. Therefore the pasture must be chosen far away from the above sources of danger into which the animals could be driven by wind. This is another reason why livestock keepers in principle never conduct the spring pasturage in low-lying places, or at least not in the first half of the season.

- at a sunlit mountain foot, where the first fresh grass grows and the pasture is as soon as possible free of snow.

Spring is the period in which calves are raised. This makes the pasture, which is located hard by the spring shelter, an important resource for both mothers and calves. A nearby mountain foot with fresh grass is from the middle of April advantageous for both. In order to preserve such a pasture for mothers and calves and to make use of distant pastures, livestock keepers travel often far away with the rest of the stock (Mong. *otor*: see more in Bold 2001: 63; 66).

Summer As far as livestock keeping is concerned, the summer months comprise the second half of May, June, July and the first half of August, during which the livestock put on weight. Average temperatures and the length of the summer period differ in the mountains, the forest highlands and the steppes. There is however a general climatic reason for the migration to the summer pasturage: to avoid the heat. While in winter and particularly in spring the livestock is protected from the cold wind, a windy and cool region is suitable for the summer pasturage. The climate of Mongolia is especially dry; 80%-90% of the annual precipitation falls in the short period of the humid months from May to September. For these reasons the suitable regions for the summer pasturage are in principle higher locations than the winter pastures, for example on mountain crests, where the winds blow more strongly. There are of course differences in connection with the differing nature zones. Since the inversion line of the Hangai and Hentii forest highlands lies lower, for example, the mountain crest on this inversion line should be avoided for the choice of summer pasture and accordingly the summer pasturage is chosen in the foothills below the winter and spring pasturages. In this case livestock keepers move with their stock often to a region with a plentiful water supply, where the inadequate coolth of the wind can be compensated with water, i.e. to a site which lies not directly at a water source but amongst hills nearby to water and which is ecologically appropriate. If mountain crests and declivities are useable for pasturage and there is a water supply to satisfy the large need of the animals, then the most favourable conditions for a summer pasturage are met. Although in the Altai Mountains

there are no plentiful water sources, this is all the same characteristic for a summer pasturage in this region.

Autumn From the second half of August the variation in temperatures increases, nights are cooler and days often comparatively warm and free of wind. In this period the animals become restless on account of the increasing fluctuations of temperature. In order to ensure that the livestock remains well nourished from summer into autumn, migrations are carried out to a warmer location where the animals can feed more peacefully and can be fattened in autumn in a regular way. Such sites, which remain even until late autumn warm and free of snow, are located characteristically in low lying regions, in the rule in all nature zones. The migration from the highlands of the summer pasture, or from the hills in forest highlands lying near to water, or from the steppes, into lowlands is carried out often very slowly in order that the summer weight increase of the animals not be lost in the course of long migration treks. This migration from the heights into the lowlands is in principle in all regions the longest of all the seasonal migrations. In the zones where the migration treks from the summer to the autumn pasture are quite long - not infrequently more than 300km - the migrations often last several weeks. As far as wind and precipitation are concerned, they play a comparatively lesser role in the pasturage of autumn than of the other seasons, since mild winds and low precipitation are characteristic for autumn, particularly in the lowlands.

Thus the seasonal climatic differences, in particular the fluctuations in temperature, are important determinants in the frequency and distances of migration in traditional Mongolian livestock keeping, as we have attempted to describe.

2. The state of vegetation as a determining factor of seasonal migration

All forms of pastoral agriculture develop predominantly where, on account of mountain ranges, highlands and valleys, the annual cycle of forage plants exhibits large differentiations over small regions: for thus is the yearly balance of food attainable by means of relatively short migration treks. This means that migration occurs not only for climatic reasons but also for reasons connected with the seasonal food balance of the animals. Therefore one of the most important factors of seasonal migration is the state of the vegetation: the seasonal division of forage plant resources and the distribution of forage plants. The four seasonal migration routes in traditional Mongolian nomadic livestock keeping have always been influenced by these two aspects of the vegetation.

We shall briefly consider their effects upon migration:

1. In the pastoral areas about fifty million tonnes of forage plant material for livestock grow annually. The forage plant resources are certainly differently distributed throughout the seasons. Thus, for example, in the case of the food requirements in summer and autumn there are 2,3 million tonnes of feed in excess. On the other hand there is a deficit in winter and in spring of about 5,5 million tonnes. This means that the food supply in summer and autumn is about 28,9 million tonnes and in winter and spring about 21,1 million tonnes (Chadraabal 1982: 24).

The capacity of pasture land is, in the investigations which form the basis of economic policy and projects, in the rule evaluated by the annual average yield of forage plant material. Since the periods of vegetation in winter/spring and summer/autumn differ due to seasonal length (200 days in the former and 165 days in the latter) and to reserves of forage plants, it would be more accurate to evaluate the actual capacity of the pasture land taking into account the periods of vegetation when the reserves of forage plants are lowest. Thus Mongolia has a reserve of pasture in winter/spring for about forty-eight to fifty million sheep. Moreover it is a fact that in spring compared to high summer the protein content of forage plants is 3,5 times less, the juiciness is 2,5 times less and the time available to pasturing on account of the lesser daylight hours and of the cold is twice as short (Moibuu et al. 1996).

The state of vegetation in Mongolia is especially characterised by the fact that climatic conditions allow only a single short period of growth. In the middle of September the grasses and plants begin to die off. This is a sign of the coming dangerous phase of the year for the herds. The new vegetation does not appear before the end of March or the start of April of the following year and even then it is so sparse that it plays no great role in the upkeeping of the animals for yet another month.

Thus the animals must live for six or seven months on the dead plants which have remained after the period of growth. The decisive factor is the quantity of vegetation at the end of summer, which must be sufficient to supply the stock until the beginning of the next growth period. As a result of this the need arises to exploit the yearly resources of forage plants by means of seasonal migrations with an optimal dividing of the pastoral regions.

From the middle of winter to the first half of spring is the period of the smallest supply of forage plants, during which the capacity of the pasture land reduces by 60% to 75%. In order to maintain a warm pasturage in this especially difficult period, the regions above the mountain slopes are made use of, in principle in all nature zones. By means of this the remains of forage plants, which have been preserved through the entire winter, are available in late spring.

In the second half of spring the period of vegetation begins. At this time too begins the active feeding period of the animals on the natural pasture. This season is characterised by the fact that the animals become especially debilitated. Therefore they must be driven into a region where forage plants that are richer in calories grow. Such sorts of forage plants are plentiful amongst the vegetation lying beneath the middle altitude of a mountain.

In order to make use of pasture areas distant from the winter site, livestock keepers normally leave this site with the entire stock excluding the mothers and the calves. Such treks are frequently quite a distance. The point of the migration is to reach a pasture in which fresh grass can grow. Such pastures are in the rule located at sunlit mountain feet which are watered by the snow.

Regarded biologically, the livestock must put on weight in summer in order that a fat layer might form in autumn to act as protection against frost. Therefore those types of plants are taken into consideration by livestock keepers so that weight increase and fattening can occur in the appropriate order. As far as vegetation is concerned, this is the actual reason for the summer pasturage. A negative consequence of a summer pasturage on a wrong pasture or amongst the wrong vegetation could be that fattening occurs too early, before the livestock has put on sufficient weight. In this case the livestock can not survive the hard winter and the feed deficient spring.

In autumn the ripeness of the various plants gradually deteriorates. Although all forage plants in Mongolia complete their ripening in general during the summer, the period of ripening of individual forage plants is quite different. The period of ripening of vegetation is connected with altitude: from the mountain crest to the mountain foot. Later ripening occurs in the lowlands and in the valleys. Moreover, as a result of the ripening process and of low precipitation the plant concentrate is comparatively high and the water content always low. There is nonetheless a climatically determined difference in the preservation of water in the plants in connection with the altitude. The point of the autumn pasturage is therefore to seek still juicy green grass and a vegetation appropriate for the fattening of the livestock. Such sites are located in the lowlands.

2. Also the distribution of forage plants plays a large role in the direction of seasonal migration. Regarded generally, the vegetation density in Mongolia continually decreases in the direction from highlands and forest highlands to southerly or southwesterly steppes and lowlands. Moreover there are in the highlands in both the Altai Mountains and the Hangai-Hentii Mountains separate vegetation zones which are dependent on the moistness, the amount of sunlight etc. of the respective microecology. However in all nature zones it is possible to establish altitudinal belts of distribution of definite sorts of forage plants, corresponding to the respective altitudes, climatic conditions and soil types (table 2). In the steppes and the Gobi region there are few altitudinal vegetation and nature belts since the difference between highlands and hollows as far as pasture is concerned is too small.

On the 131.1 million hectares of pasture area of Mongolia about 2,300 types of herbage grasses and other plants grow, which belong to about 580 different plant families. Of these about 600 types of plants are usable for the food requirements of the five most important sorts of animals (Cerendulam 1994: 3).

Of the above mentioned 2,300 plant types about 550 widespread types of forage plants have been quite well researched. Pasture scientists claim that 47% of these are frequently or willingly eaten by livestock and nutritious plants, 4% are of very good food quality, 44% are rarely or unwillingly eaten plants and 5% are poisonous plants for animals (Mongol orny ... 1966: 4). Of course the forage plants have different significance for the various animal types. From available research material concerning

Table 1. Forage plant types in the nature zones according to the seasonal need of the animal types

	In summer and autumn	In winter and spring
Sheep/Goat	**In mountain highlands:** Festuca lenensis, Poa attenuata, Koeleria macrantha, Oxytropis nitens, Oxytropis filiformis, Phojodicarpus sibiricus, Stellera chamaejasme, Festuca sibirica, Polygonum angustifolium, Coluria geoides, Cotoneaster melanocarpa, Grossularia acicularis, Pentaphylloides fruticosa, Helictotrichon altaicum, Carex pediformus, Koeleria cristata, Aster alpinus, Allium senescens, Allium odorum and Artemisia frigida; **In steppes:** Stipa klemenzii, Stipa gobica, Cleistogenes squarrossa, Artemisia frigida, Stipa glareosa, Anabasis brevifolia, Allium polyrrhizum, Thymus gobicus, Dracocephalum foetidum, Artemisia rutifolia, Ajania fruticulosa. Lagochilus ilicifoius, Scorzonera capito, Agropyron repens, Koeleria pers. und Zygophyllum pterocarpum; **In Gobi and desert region:** Stipa gobica, Stipa glareosa, Anabasis brevifolia, Ajania fruticulosa. Lagochilus ilicifoius, Scorzonera capito, Zygophyllum pterocarpum, Artemisia xanthochroa, Artemisia xerophytica and Salsola laricifolia	**In mountain highlands:** Stipa krylovii, Arenaria capillaris, Arctogeron gramineum, Artemisia ruthifolia, Agropyron cristatum, Filipendula adens. and Caryopteris; **In steppes:** Cleistogenes squarrossa, Koeleria cristata, Sibbaldianthe adpressa, Haplophyllum dauricum, Astragalus galactites, Caragana microphylla, Caragana stenophylla, Stipa grandis, Stipa baicalensis, Stipa krylovii, Arinaria capillaris, Arctogeron gramineum, Artemisia ruthifolia, Caryopteris mongolica, Koeleria macrantha, Artemisia scoparia, Agropyron cristatum, Ephedra sinica, Caragana bungei and Leymus chinensis; **In Gobi and desert region:** Stipa klemenzii, Stipa krylovii, Stipa glareosa, Stipa gobica, Cleistogenes squarrossa, Salsola passerina, Artemisia dracanulus and Artemisia commutata
Cow	**In mountain highlands and grassland steppes in mountains:** Larix sibirica, Betula platiphylla, Carex lanceolata, Vicia venosa, Vicia unijuga, Iris luthenica, Fragaria orientalis, Filifolium sibiricum, Polygonum divaricatum, Iris dichotoma, Hemerocallis minor, Clematis hexapetala, Stipa baicalensis, Helictotrichon schellianum, Helictotrichon desertorum, Coluria geoides, Onosma arenarie, Scabiosa ochroleuca, Spiraea hypericifolia, Koeleria mukdenensis, Cleistogenes kitagawae, Lespedeza dahurica, Saposhnikovia divaricata and Stellera chamaejasme; **In steppes and lowlands:** Larix sibirica, Salix kochiana, Salix viminalis, Pentaphyloides fruticosa, Carex dichroa, Carix orbicularis, Salix rhamnifolia, Cyperceae J.St., Stipa krylovii, Stipa baicalensis, Dasiphora raf. and Salix ledebouriana	**In mountain highlands:** Lasiagrostis link., Agropyron cristatum and Agropyron repens; **In steppes in middle mountains:** Stipa baicalensis, Stipa sibirica, Thalictrum petaloideum, Filifolium sibiricum, Cerastium arvensa, Clausia aprica, Stipa krylovii, Arenaria capillaris, Arctogeron gramineum, Artemisia ruthifolia and Caryopteris mongolica
Yak	**In high mountains:** Cerastium lithospermifolium, Dryadanthe tetrandra, Waldheimia tridactylites, Parrya exscapa, Valerianapetrophylla, Kobresia bellardi, Kobresia humilis, Carex rutestris, Hylokomium splendens, Aulacomnium turgidum, Kobresia billardii and Festuca altaica	

Table 1. (continued)

Horse	**In mountain highlands:** Helictotrichon desertorum, Coluria geoides, Onosma arenaria, Scabiosa ochroleuca, Filifolium sibiricum, Poligonum devaricatum, Iris dichotoma, Hemrokallis minor, Clematis hexapetala, Stipa baicalensis, Helictotrichon schellianum, Stipa krylovii, Arenaria capillaris, Arctogeron gramineum, Artemisia ruthifolia, Caryopteris, Koeleria mukdenensis, Cleistogenes kitagawae, Lespedeze dahurica, Saposhnicovia divaricata, Stellera chamaejasme, Stipa krylovii, Leymus chinensis, Bupleurum scorzonerifolium, Galium verum and Astragalus melilotoides; **In steppes:** Agropyron repens (L.) P.B., Stipa (L.), Agropyron cristatum (L.) Geartn, Cleistogenes Keng., Koeleria Pers, Artemisia frigida and Allium senescens; **In Gobi and desert region:** Artemisia commutata	**In mountain highlands:** Stipa krylovii, Arenaria capillaris, Arctogeron gramineum, Artemisia ruthifolia and Caryopteris mongolica; **In steppes:** Stipa baicalensis, Stipa sibirica, Thalictrum petoloideum, Filifolium sibiricum, Cerastium arvense, Clausia aprica, Stipa krylovii, Arenaria capillaris, Arctogeron gramineum, Artemisia ruthifolia, Cariopteris mongolica, Cleistogenes squarrossa, Koeleria cristata, Sibbaldianthe adpressa, Haplophyllum dauricum, Astragalus galactites, Caragana microphylla, Artemisia frigida, Artemisia scoparia, Agropyron cristatum, Ephedra sinica and Caragana bungei; **In Gobi and desert region:** Stipa klemenzii, Stipa krylovii und Cleistogenes squarrossa
Camel	**In steppes:** Stipa klemenzii, Stipa gobica, Cleistogenes squarrossa, Artemisia fregida, Stipa glareosa, Anabasis brevivolia and Allium polyrrhizum; **In Gobi and desert region:** Sympegma regelii, Haloxylon ammodendron, Ephedra przewalskii, Kalidium, Salsola passerina, Reaumuria songalica, Haloxylon ammodendron, Vicia costata, Hedysarum fruticosum, Iris tenuifolia, Allium mongolikum, Artemisia klemenzii, Caragana bungei, Psammochloa villosa, Leymus racemosus, Artemisia xerophytica, Artemisia sphaerocephala, Colligonum mongolicum, Arnebia guttata and Eurotia ceratoides	**In steppes:** Stipa glareosa, Stipa gobica, Salsola passerina, Lasiogrostis link., Cleistogenes squarrossa, Chenopoiaseas less., Eragrostis host. and Urtucaceae endl.; **In Gobi and desert region:** Haloxylon ammodendron, Stipa gobica, Stipa glareosa, Ajania fruticulosa, Lagochilus ilicifolius, Scorzonera capito and Caragana pygmaea

Source: Gonchigjav, Ds,... (ed.), Livestock breeding (mong.), Ulaanbaatar 1980; National Atlas of the MPR (mong. und rus.), Moskau 1990

Table 2. The altitudinal distribution of forage plant species in the environs of the Hangai Mountains

h (m)	
higher than 3500	1. Gravel and forests
3000	2. The pastural region in the grassland mountain tundra with Betula rotundifolia, Dryas oxyodontha and in the forest high mountains with Hylocomium splendens, Aulacomnium turgidum, Kobresia bellardii and Festuca altaica
2500	3. The pasture land in the mountain taiga with Poa sibirica, Viola biflora, Hylocomium splendens, Rhytidium rugosum, Festuca altaica, Carex amgunensis, Pedicularis verticillata, Delphinium crassifolium, Rhydidium rugosum, Carex lanceolata, Iris ruthenica, Vicia venosa and Fragoria orientalis
2000	4. (Northwest to south) The pasture land in the semi-desert steppes with Cleistogenes squarrosa, Stipa glareosa, Caragana bungei, Caragana leucophloea, Stipa sibirica, Agropyron nevskii, Artemisia rutifolia, Allium eduardii, Lophanthus chinensis, Amygdalus pedunculata and Berberis sibirica; The pasture land in the dry steppes with Cleistogenes squarrosa, Agropyron cristatum, Stipa krylovii, Ephedra sinica, Iris tenuifolia, Vincetoxicum sibiricum, Artemisia campestra, Leymus racemosus, Caragana bungei, Artemisia dolosa, Saussurea pricei, Allium eduardii and Berberis sibirica; The pasture land in the dry steppes of the lower mountains with Stipa krylovii, Cleistogenes squarrossa, Koereria kristata, Sibbaldianthe adpressa, Haplophyllum dauricum, Astragalus galactites, Caragana microphyla, Caragana stenophylla Stipa grandis, Stipa baicalensis, Koeleria macrantha, Artemisia frigida, Artemisia scoparia, Arenaria capillaris, Arctogeron gramineum, Artemisia ruthifolia and Caryopteris mongolica
1000	5. (Northwest to south) The pasture land in the desert with Amygdalus pedunculata, Artemisia xerophytica, Artemisia xanthochroa, Eurotia ceratoides, Ephedra przewalskii, Calligonum mongolicum, Psammochloa villosa, Iris tenuifolia, Arnebia gutatta, Artemisia globosa, Artemisia sphaerocephala, Eurotia ceratoides, Anabasis brevifolia and Stipa glareosa; The pasture land in the desert steppes with Caragana bungei, Stipa glareosa, Artemisia xanthochroa, Artemisia xerophytica, Psammochloa villosa, Leymus racemosus, Hedysarum fruticosum, Artemisia sphaerocephala, Stipa gobica and Salsola passerina; The pasture land in the semi-desert steppes with Stipa klemenzii, Stipa krylovii, Cleistogenes squarrosa, Stipa gobica, Artemisia frigida, Thymus gobicus, Dracocephalum foethdum and Artemisia rutifolia; The pasture land in the desert steppes of the lower mountains with Stipa gobica, Stipa glareosa, Anabasis brevifolia, Allium polyrrhazum, Ajania fruticulosa, Lagochilus ilicifolius, Scorconera capito and Zygophyllum ptercarpum

Source: Yunatov, A. A., Fundamental features of the vegetation cover of the Mongolian People's Republic (Rus.), Leningrad 1950

Ölziihutag, N., Overview of the distribution of vegetation in Mongolia (Mong.), Ulaanbaatar 1989

National Atlas of the MPR (mong. und rus), Moskau 1990

forage plants it can be determined which plant types are preferred by which animal types (table 1). This then makes it possible to ascertain, according to the distribution of the forage plants, in which direction the animals should migrate in the course of the seasons.

In general the seasonal food balance for all types of animals can be divided into two main periods: firstly, the active feeding in the period of vegetation, and secondly, the period of maintenance of weight gain and fattening in the inactive months of the vegetation. The time of vegetation is so short that it must be exploited to the full for an effective pasturage. Therefore the attaining of a well-nourished condition of the livestock in the active vegetation period is divided into the following feeding periods:

1. the return of strength (Mong. *usan badailga*) from April until May, the second half of spring,
2. the putting on of weight (Mong. *mahan targa*) from June until the middle of August,
3. the fattening (Mong. *ööhön targa*) from the second half of August until the start of November.

Thus the distribution of the forage plants is one of the most important factors for pastoral migration, upon which the direction and distance of the migration depends.

In order to understand this better, it is useful to consider an example in closer detail. The seasonally eaten forage plant types found predominately in the region of the Hangai Mountains have been schematised in table 1, classified according to animal types. In table 2 which represents the altitudinal distribution of forage plants in this region we see that levels of vegetation containing the basic forage plant types are formed following one upon the other according to altitude.

If we compare the two tables, namely the seasonal division of the supply of plants and the distribution of the forage plant types, it becomes clear that the seasonal pasture regions in the environs of the Hangai Mountains, as far as the distribution of forage plants is concerned, are unequivocally connected with the differences in altitude. This in principle corresponds to the climatically determined altitudinal ordering of seasonal migrations.

3. Salty soils as a determining factor of altitudinally directed migration

The significance of salty soils for livestock and for seasonal migration has been neglected in investigations concerning nomadic livestock keeping in Mongolia. The reason for this is that the original seasonal migration to salty soils has become impossible or is overlooked, in particular in the last decades, as a result of newly established territorial-administrative borders. I consider it important that salty soils be considered as a basic motive for seasonal migration.

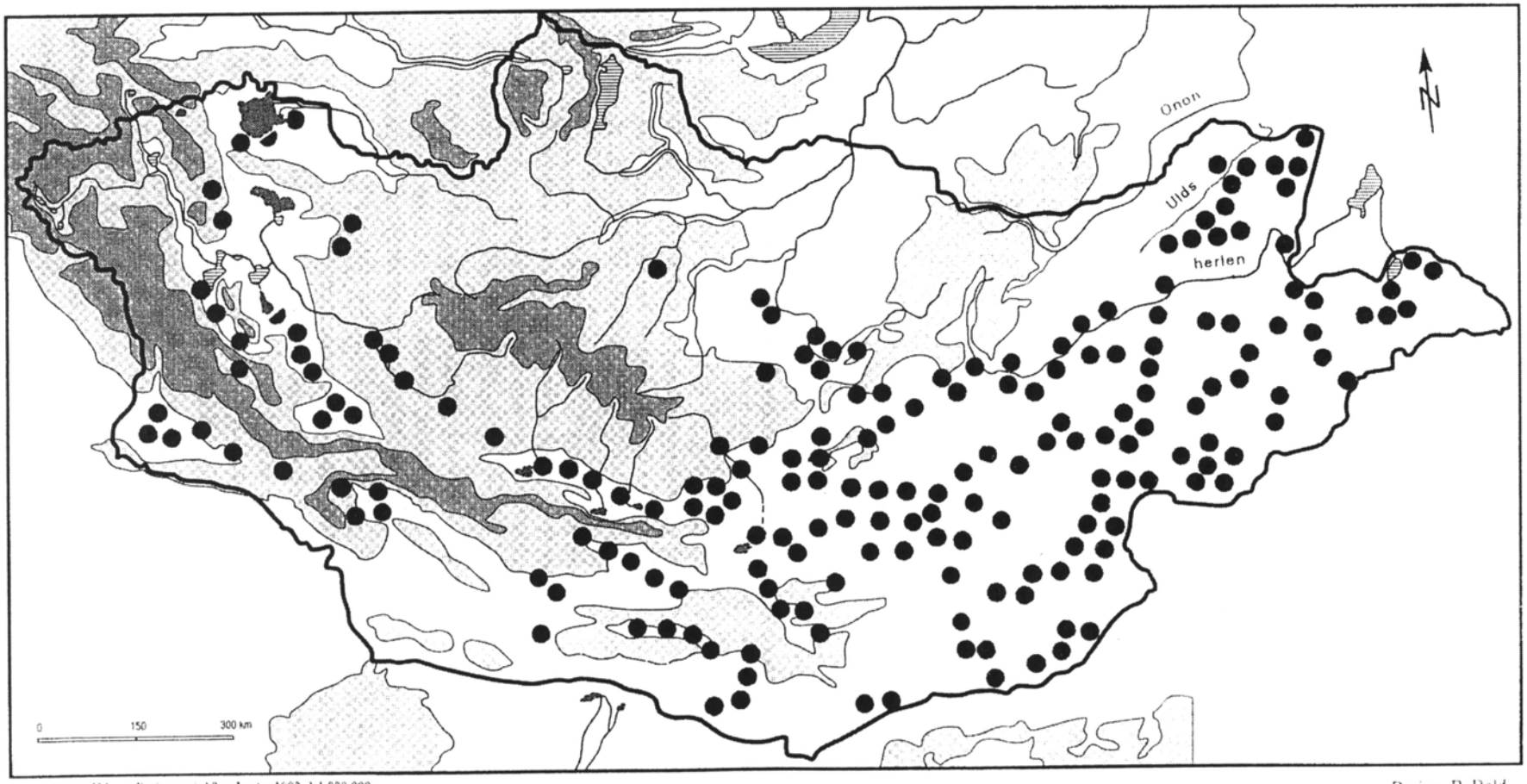
The salty soils of the pasture land of Mongolia are very rich in sodium (Na) and potassium (K) which are the most important elements for the growth and the strengthening of the bone tissue of the animals as well as the most important chemical constituents of bone marrow, magnesium (Mg) which is one of the most important elements of the muscle tissue, and copper (Cu) which is necessary for blood formation and for the functioning of the respiratory organs.

Thus salts play a very important role in the putting on of weight and in particular in the fattening as well as the maintenance of a well nourished condition of the livestock in autumn. Since the livestock do not obtain an adequate amount of the above mentioned elements from plants, salty soils are the only supplementary source of minerals. Salty soils are in no way used occasionally or seasonally but quite regularly. For example sheep must pasture on salty soils in average once every five to seven days in winter, every three to four days in spring, every four to seven days in summer and autumn (Gonchigjav et al. 1980: 141). The regularity of course depends upon the mineral content of the soil. If the summer and autumn pasturage takes place on soils low in salt, horses, for example, must once every seven to ten days pasture on salty soils.

Thus there arises the need to allow livestock to graze in regions rich in salts. Livestock keepers take into consideration when choosing a pasture not only favourable climatic conditions and the state of the vegetation but also the salt content of the soils. In the rule every seasonal pasturage must have salty soils available.

A physical-geographic investigation of the pattern of the distribution of salty soils in connection with the pasture land in Mongolia has only to a limited extent been carried out. As we see in the

Map 1. Distribution of Salty soils in Mongolia



Source: Map of Mongolia (mong.), Ulaanbaatar 1993, 1:1 000 000

Design: B. Bold

distribution of salty soils in(map 1), an increase in salt deposits is noticeable from about the northwest tothe southeast of Mongolia. In the forest highlands the proportion of salty soils is the smallest, while in the steppes and the Gobi and desert regions very high. This tendency is valid not only generally on a large scale but also locally: in the mountains almost nothing, at the mountain foot and in the valleys more frequent.

That the density of vegetation, as mentioned above, decreases gradually from the highlands and forest highlands to the steppes and the Gobi and the nutritional value of a food unit thereby increases, stands in close connection with the distribution of salty soils. Salty soils are divided in livestock economic practice according to the concentration of minerals into sparse and rich soils. In the lowlands the mineral content of salty soils is in the rule higher than in the highlands. According to experience as well as to the results of research the following regions in the steppe zones have been identified as having salty soils of good quality: Bor Ovoo (in the Övörhangai-Aimag/Bayanöndör-Sum), Olon Nuuryn Gol (in the Bayanhongor-Aimag/Bayanbürd-Sum), Erdene Uul, Gutlyn Ulaan Uul, Rashaant (in the east steppe region) etc. (Mongol orny ... 1966: 52).

Mongolian historical sources report that livestock keepers migrated in autumn with their stock often far into the south or the southeast, to the Gobi, to regions with soil rich in salts. This is still more or less the case today. But in this there are considerable difficulties in connection with the current close-meshedness of the rural territorial-administrative borders. In the period of collectivisation (*Negdel*), 1959-1991, it became habitual to satisfy the needs of the animals by transporting salt. However there is still today amongst the herdsmen in those Sums, within the borders of which there exists a region of salty soils, an attempt particularly in autumn to move with their stock into low-lying areas. Here the direction of migration to salty soils corresponds with the other goals of autumn migration, namely the attainment of favourable climatic conditions and of a suitable vegetation.

4. Access to drinking water as a determining factor of migration

Water plays differing roles in mobile livestock keeping. Above all water is one of the most important constituents of nourishment. For example a sheep requires three to four litres of water in order to digest one kilogram of dry food. The required amount of water of course depends upon the respective climatic conditions as well as the juice content of the plants. Sheep drink each time about two to two and a half litres of water. In summer sheep must receive water two to three times daily under the most favourable climatic and vegetative conditions, in spring and autumn once or twice daily and in a winter with heavy snowfalls once every second day. This is valid also for the other types of animals (Gonchigjav et al. 1980: 144).

On hot summer days the need for water is even higher since the livestock are cooled down by means of water, i.e. by perspiring. Therefore livestock keepers in summer as well as in autumn migrate to the river valleys and lakes. Since on summer days there are at the water sites in the lowlands many mosquitoes, midges and horseflies, the summer pasturage is carried out on windy hills lying near to water. When the insect pests disappear in autumn on account of the decrease in temperature, it is possible to move downwards direct to the water source.

In winter the livestock require relatively little water on account of the sparse vegetation and of their physiological adaptation. The need for water in winter is mostly satisfied by the disintegration of acquired fat and by snow. A superfluous amount of water through drinking would decrease the resistance of the livestock to cold. Therefore a pasture distant from a water source is most favourable in winter. The fact that regions lying nearby to water are cold in winter is another reason to seek out a pasture away from water sources and rivers. Moreover the source of water is of great significance in the division and the divided use of the pastoral regions. Watersheds delimit climatic-geographic belts and the gradings of vegetation both altitudinally and planarly, and thereby form comparatively isolated pasture strips or areas.

In historical sources and on ancient maps of Mongolia the locations of the ancient tribes were always represented in the vicinity of sources of drinking water - larger rivers or permanent fresh water lakes or abundant springs. Also in the later establishment of territorial-administrative borders the entirety of a pastoral area and the availability of water were especially considered. For example larger

rivers, lower river valleys or fresh water lakes in the lowlands were used as border lines of pastoral areas. However in the Negdel period this was of lesser significance. Owing to the organisation of livestock keeping, the territorial-administrative divisions were made smaller and the number of such regions was massively increased. In 1990 there were in all 310 Sums in Mongolia (see more in: Bold 1997).

The supply of drinking water is often ensured by the building of wells. In 1991 there were about 37,600 treadwheel wells (in the Gobi and steppe regions the wells must be dug deeper) and 3,600 built up springs (Mongolian economy ... 1993: 40). This brought both advantages and disadvantages. If in the case of a scant network of natural water sites the pasture lands about these sites do not overlap, then the pastures remain unused for the greater part of the year or even over the years. They offer in the alternative planning of the nomads a natural food reserve, which is opened up only in those years when natural water sites are formed owing to a greater degree of moisture, since then sufficient water is available. These mostly unusable pasture zones are now opened up to the nomadic economy by means of the construction of the treadwheel wells. The nomads now make use of these wells even during periods of low rainfall, and as a consequence the natural food reserve is used up. The damage is even greater since the water potential of the wells is in most cases higher than the grazing potential in their vicinity. The mobility of the nomads, which was once forced by the exhaustion of the water sites, is being limited. A certain devastation of the vegetation of the pasture about the wells is also a consequence. The wells therefore are more or less depriving the nomads of their natural pasture reserves.

5. Geographic borders as an influencing factor of the direction of migration

Not only climatic conditions, the state of the vegetation and the distribution of salty soils and water sources are of significance for the distance and frequency of migration, but also geographic borders. In general they are divided into ecologically and economically determined borders. The ecologically determined borders include mountain crests, larger rivers, cliff regions, deserts, valleys, etc. Besides these, which are determined by altitude and natural markings, there are also economic margins of the pasture land. Obvious borders are formed by settlements and industrial areas, by paths, roads and railways.

From the above the wrong impression might be gained that the borders of the pasture land are once and for all fixed. This is however in no way the case. The ecologically determined borders are relatively stabile, but the economic margins are certainly not. They are formed in flexible adaptation as a consequence of technological and social-economic development. Thus there is, for example, in the lower river valleys of Orhon, Selenge and other rivers, which have their sources in the Hangai and Hentii Mountains and which today are located in the Selenge-Aimag, hardly any pastoral area. The reason for this is that the pasture land has been superseded as a result of the development of farming and industry in this region. The rate of industrialisation in the Selenge-Aimag is in average three times higher than in the other Aimags.

On the basis of what has been said about the ecological factors of seasonal migration, the ordering of the seasonal pasture areas in Mongolia, i.e. how and in what relation to the ecological factors the four seasonal pasture regions lie, can be described. There are however two variations: first, the locations of the actual or the original pasture areas, in which case the economic or socially determined borders have no part, and second, the locations of the present pasture areas, in which case all economic and ecologically determined borders are considered.

On the basis of the above discussed ecological determinants we can distinguish basic forms of seasonal migration.

In winter the best pasture regions lie, on account of the favourable combination of temperature, wind and precipitation, in principle in all three nature zones in the belt between the higher and middle mountain ranges. The winter site is therefore located on a higher south slope of a mountain or in a mountain cleft away from the wind direction.

The spring pasturage on the other hand takes place somewhat below the winter pasturage, on the south face of a mountain between a middle altitude and the mountain foot. Although in general the

lower the location the warmer it is, snow often remains at the mountain foot and in the lowlands until May, and nights can be cold and damp.

The suitable regions for the summer pasturage are for climatic reasons located on the higher parts of a mountain, higher than the winter pastures, for example on mountain crests, where the winds blow more strongly. There are of course differences in connection with the differing nature zones. Since the inversion line of the Hangai and Hentii forest highlands lies lower, for example, the mountain crest on this inversion line should be avoided for the choice of summer pasture and accordingly the summer pasturage is chosen in the foothills.

In order to ensure that the livestock remains well nourished from summer into autumn, migrations are carried out to a warmer location where the animals can feed more peacefully and can be fattened in autumn in a regular way. Such sites, which in comparison to other areas remain even until late autumn warm and free of snow, are located characteristically in low lying regions, in the rule in all nature zones.

If we compare the forage plant types according to seasonal divisions and the altitudinal distribution of forage plants it becomes clear that the seasonal pasture regions, as far as the distribution of forage plants is concerned, stand in a belt-like relation with the differences in altitude.

Moreover salty soils play a very important role in the putting on of weight in summer and in the fattening as well as the maintenance of a well nourished condition of the livestock in autumn. Since in the distribution of salty soils there exists the phenomenon that the mineral content is lowest in the highlands and highest in the lowlands, the seasonal migration should in the main be determined altitudinally.

Since on summer days there are at the water sites in the lowlands many mosquitoes, midges and horseflies, the summer pasturage is carried out on windy hills lying near to water. When the insect pests disappear in autumn on account of the decrease in temperature, it is possible to move downwards direct to the water source. The fact that regions lying nearby to water are cold in winter is a reason why it is necessary to seek out a pasture away from water sources and rivers during this season. Moreover the source of water is of great significance in the division and the divided use of the pastoral regions.

Geographic borders influence migration routes, i.e. they determine in which direction and where the migrations should be carried out.

The effects of all these factors on the seasonal migrations are connected with differences in altitude. From this it follows that the seasonal migrations in principle in all nature zones are determined altitudinally. However this view should not serve as an argument that in Mongolia there are absolutely no planar migrations. On the contrary livestock keepers undertake quite frequently planar (horizontal) migrations in the course of a season in order to extend the pasturage and to satisfy food requirements

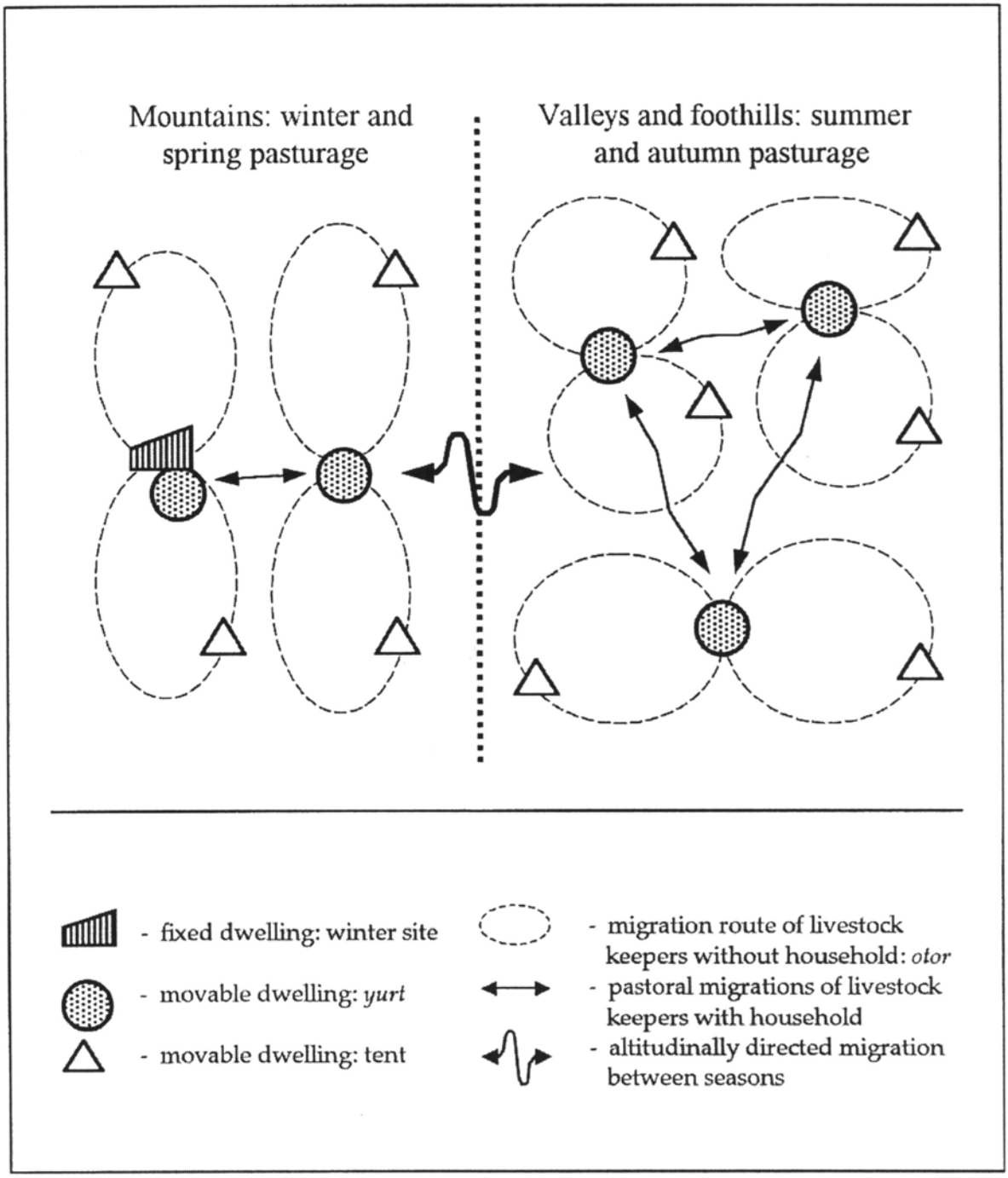
(fig. 3).

There are in respect to pasture and ecologically speaking two main regions of Mongolia: mountainous land and the steppes/Gobi, whereby mountainous land is divided according to the respective ecosystems into two sub-regions, the highlands in the Altai Mountains and in the Hangai-Hentii Mountains (Bazargür et al. 1989: 104–44). As far as pastoral migration is concerned, there are thus three different types of migration corresponding to the defined nature zones: migrations in the Altai Mountains, in the Hangai-Hentii Mountains and in the steppes/Gobi region. In addition livestock keepers conduct their seasonal migrations in the steppes in Central and East Mongolia and in the southeast Gobi region in quite different manners.

This has probably been caused by the too closely drawn administrative borders, in which the actual pastoral region has not been considered. In the first two forms the seasonal migrations quite evidently correspond to differences in relief and are altitudinally directed. There is however a clear difference in connection with the order of the change of pasture, depending upon orographic conditions.

Seasonal migration in the Altai Mountains This mountain chain, which stretches from the northwest of Mongolia to the southern Gobi, is almost devoid of forests. The mountain system is surrounded by valleys and hollows. It borders onto the Altai valley of the northern Gobi which is covered with numerous saltpans and sand plains and which extends from the basin and over the broad valley of the Gobi lakes, as well as onto the Altai valley of the southern Gobi where there are

Figure 3 General pattern of holizontal migration of Mongolian nomads



substantially less lakes and sand plains but more gravel plains. This valley is comprised of three parts: in the west the Achit valley, in the south the Alashan Gobi and between the two the Trans-Altai Gobi. These orographic conditions enable livestock keepers to exploit to the full by means of migration the natural pasture from the mountain crests to the valleys and foothills. This permits a seasonal migration from the peaks to the lowlands in the order summer, winter, spring, autumn. There are however in some regions other variations of the order, eg. winter, spring, summer, autumn (fig. 4A).

Seasonal migration in the Hangai-Hentii Mountains The massive Hangai-Hentii Mountain system also borders on the great lake basin in the west and on the southern Gobi in the south, and is bordered in the east and southeast by the undulating eroded plains of the steppes and Steppe-Gobi which are covered with numerous saltpans. Between these two mountainous lands, the broad river valleys of the Orhon, the Selenge and the Tuul are situated. It is here characteristic that the south faces of the slopes and partly of the mountain crests (eg. in Hangai) are cliffy and steep rising. The northern slopes and in part also the northern crests are on the other hand forested and levelled out. Mongolian forests, which cover in all only 9.6% of the country, are comprised almost entirely of the forest regions of the Hangai-Hentii Mountain system and the Khövsgöl Mountains.

As a consequence the herdsmen are not able to make use of the mountain crests for pasturage, and in particular for the pasturing of sheep and goats, and therefore allow their stock in the rule to graze only as far as the inversion line. Thus it happens that the altitudinally directed seasonal migration from the peaks to the lowlands are ordered winter, spring, summer, autumn (fig. 4B). However in a region where either there are crests devoid of forest or gravel and accessible to the livestock or the inversion line is higher than about 2,300m, the first variation of migration as in the Altai Mountains is also possible.

Seasonal migration in the steppes The high steppes of eastern Mongolia, which in the west are bordered by the Hangai-Hentii Mountains, are above all in the north covered with undulating eroded plains rich in salts. They are divided approximately through their centre by the voluminous Herlen River which flows into the Dalai Nuur. The east lying Lake Buir is situated on a huge plate-like high steppe. Here there is a relatively small difference in altitude between the highlands and the lowlands. For this reason seasonal migrations from the heights into the lowlands are ordered winter/spring, summer/autumn, whereby the pasturages for winter and spring are conducted at about the same altitude, as are those for summer and autumn (fig. 4C). One sees here that this form is not only a planar migration determined by thermal and humidity conditions but also clearly altitudinally directed.
The extremely extensive and flat eastern and southeastern Gobi valley is a steppe sparse in vegetation. Stretching valleys and flat hollows, partly covered with salt lakes and sand marshes, characterise the landscape. Desert steppe and desert alternate. Ponds and small flat lakes are formed temporarily after heavy rainfalls. Although some scholars conjecture that migrations specially suitable for the region are here carried out, results from research show no particular form of migration comparable to that in the steppes. I am of the view that seasonal migration within the steppes is incomplete on account of a delimitation of the original pastoral strips by territorial-administrative borders. Through this the traditional, ecologically adapted migration routes and directions have in essence been simplified.

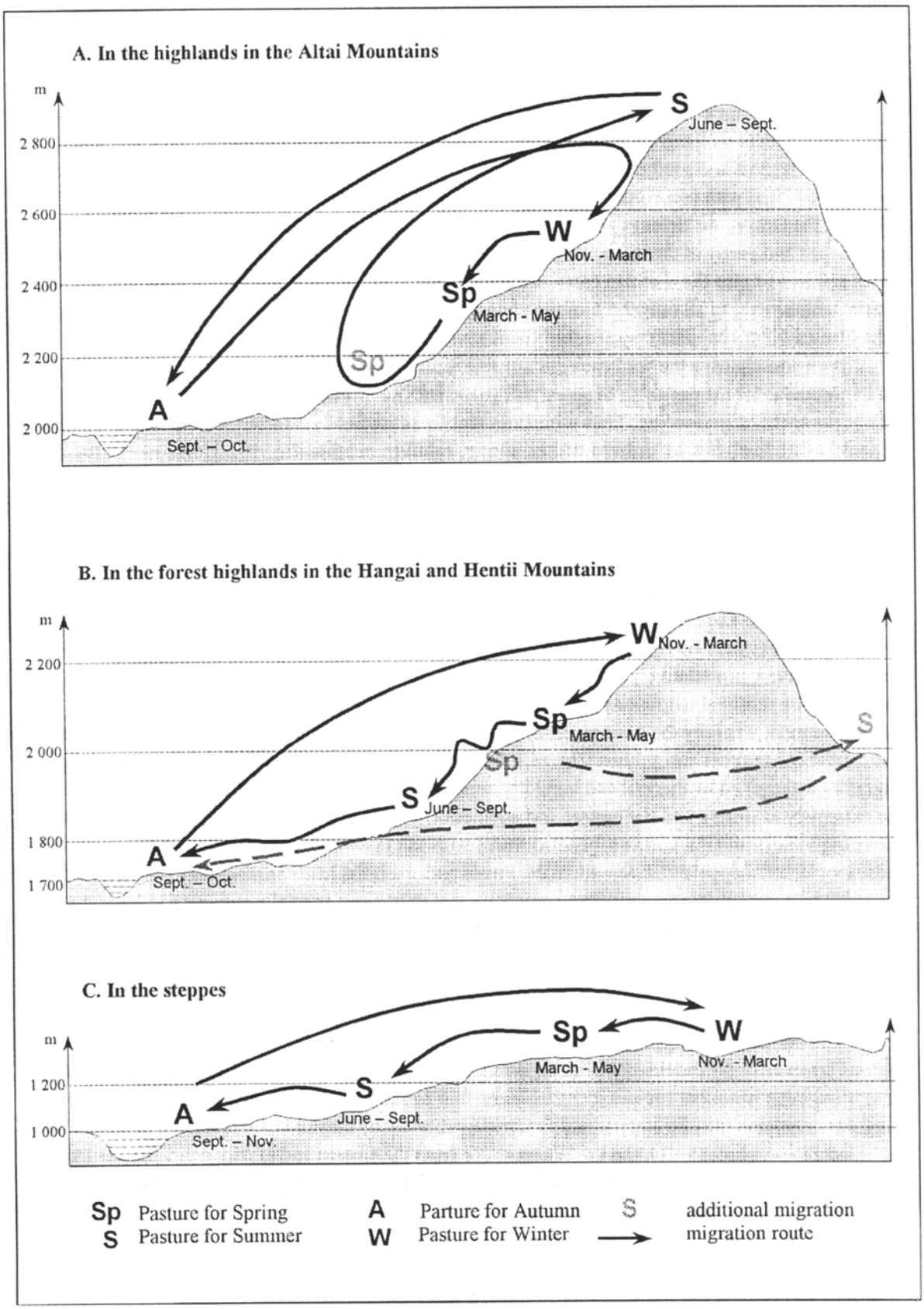
The climatic and vegetative conditions and the numerous saltpans and water reserves in these regions are exactly the requirements for an autumn pasturage, and in part too for a summer pasturage. From Mongolian historical sources it can be learnt that nomadic herdsmen for just this reason moved in particular in autumn into the steppes and desert steppe, whereby they covered distances of up to 750km. Regarded geomorphologically, the lowland corridor from the eastern end of Mongolia, the Menen Steppes, to the southern end, the Galbiin Gobi, is a geographic borderline of the flatlands of the northwestern and southwestern highlands and of the pastoral regions of both sides.

As already mentioned, these are only the basic forms of migration. There are in addition numerous variations of and experiments in seasonal migrations connected with the respective conditions and geographic borders of the pasture land.

7. Rural territorial-administrative divisions as an influencing factor on migration pattern

Thetirection, distance and frequency of nomadic migration is determined not only by ecological

Figure 4 General pattern of seasonal migration in different zones



indicators. The migration pattern has been affected by socio-political dimensions during different historical periods (see more: Bold 1997).

Research into a concrete regionalisation of the seasonal pastoral regions in Mongolia has hitherto been carried out only to a limited extent. For this reason the division of pastoral areas, which should make available a sufficient area of the pasture land as well as defined ecological areas required for the four seasons, has received no consideration in the territorial-administrative policies of the last seven decades in particular.

The traditional migration paths, directions and distances, which have been established by many years of empirical experience, are actually the significant factor for a conception of the location of the pastoral areas. These migration paths have been in the course of history more or less strongly influenced, i.e. livestock keepers now migrate with their stock no longer according to the traditional migration paths. Livestock keepers of today confine themselves to the pasture land within a defined territorial-administrative region. This means that with present seasonal migration paths the actual pastoral area, which in principle is ecologically fitted to a seasonally divided use, is hardly recognisable.

Therefore it is also important to briefly compare the influence of territorial-administrative borders and their relationship to pastoral areas in a historical context.

In the ancient Chinese chronicles frequent reports about the northern nomadic neighbours appear only after the 2nd century B.C.E. There are many reports in the chronicles about how the nomads appropriate for themselves a certain area. This is established by the fact that the nomads had a certain pastoral region and conducted the four seasonal migrations within these borders.

These reports convey to us notions about the past territories of the nomadic tribes. With the help of the ample reports to be found in the chronicles of the 2nd B.C. to the 1st A.D. and of the 6th to the 8th centuries, one can approximately see that the territories of the nomadic peoples ranged over highland and lowland regions (Bichurin 1950: vol. 1; Kyuner 1961; Taskin 1984). However to what extent the pastoral areas and the tribal locations corresponded with one another cannot be detemined from the details on account of the deficiency of the documentation of the chronicles.

From reports in the chronicles such as 'Collection of Chronicles' by Rashid ad-Din, 'Secret History of the Mongols' and 'Altan Tovch' etc. one can clearly see the constellation between the pastoral areas and geographical relief. There were no homogeneous but heterogeneous ecological conditions in the geographical background of the locations of the then larger nomadic tribes: each tribal group possessed its own region of pasturage which extended from the mountains into the lowlands.

If we compare the location of the pasture regions, which are to be altitudinally ordered between highlands and lowlands/valleys - as depicted in fig. 1 - with the locations of the tribal groups, we see that they on the whole harmoniously correspond.

'Altan Tovc' reports that even the Mongolian subtribes, which carried out livestock keeping in the spacious pasture land of the eastern Hentii Mountains lying between the voluminous Herlen and Onon Rivers, often moved in fall far northeast to the Ulz River. The reason for this was the salty soils. From the details of the source one can see that the summer pasturage was conducted in the somewhat higher region of the upper surrounding area of the Onon River (Luvsandanzan, 18, 23, 26, 30, 31, 38).

The development of the territorial-administrative border setting of the Mongolian Hoshuu [2] system in the period under the Manchurian rule strongly influenced the gradual breakdown of the above described correspondence between the locations of tribes and of the pasture regions.

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[2] Hoshuu: It is conjectured that the term 'Hoshuu' was used about the 14th/15th century in connection with military regions. Gradually Hoshuu became a term to describe the largest administrative-territorial units until that time when the Aimag became the largest units. In the 16th century after the death of the prince Geresendz (1513-1549), the youngest of eleven children of Batumungke Dayan Khan (ruled 1470-1544), the last emperor of the Mongolian Empire, his territory was divided between his sons into seven Hoshuu. From the seven Hoshuu in the first half of the 17th century there arose the first three Aimag (see footnote 3) in Halha (Outer) Mongolia: Tusheet Khan Aimag, Secen Khan Aimag, to each of which one Hoshuu belonged, and Zasagt Khan Aimag, to which four Hoshuu belonged. From this there followed a small loss of significance of the original Hoshuu division. After the conquest of Halha Mongolia by Manchuria, these administrative Aimag and Hoshuu divisions were taken over, however in a strongly

Since we do not have a detailed documentation and cartography[3] of the locations of the Hoshuu in the period from the end of the 16th to the end of the 17th century, it is difficult to determine the degree of correspondence between the location of the pasture area and the then territorial-administrative divisions. However, it seems that the correspondence of these two factors has been still harmonic. The number of Hoshuus in this period were comparatively small. And the number of complaint charges in this period, regarding the lack of pasture land, were relatively small in comparison to the later developments in the Hoshuu structure.

From the middle of the 18th century until 1911 the number of territorial-administrative units increased further.

On the Aimag[4] and Hoshuu maps from the period of the end of the 18th to the start of the 19th century one can in a general way recognise the geographical location of the four Aimag and Hoshuu which one could compare with an ecologically appropriate regions for pastoral utilisation.

From the sizeable and now improved manuscript maps of the Hoshuu, which had been produced since the middle of the 19th century, it is clearly recognisable that the majority of the Hoshuu were situated in a natural region, which extended altitudinally from the highlands to the lowlands/valleys in a linear way (Albun 1987).

In the course of the time many Hoshuu were formed by imperial command as appanage or favour or reward for service to the Manchurian emperor. According to descriptions from the official files and laws the Hoshuu territories were officially differentiated into:

- traditionally formed Hoshuu (Mong. *hev olson*),
- Hoshuu formed by command (Mong. *danst* or *togtoolt*).

Many Hoshuus had been formed not only in the Manchurian period but also after the victory of the national independence movement in 1911, as appanage or favour or reward for service to the great dignitary rJe-btsun dam-pa Hutagt – the religious head of Halha Mongolia.

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administered form. With the appointment of thirty-four representatives of the nobility descended from Genghis Khan as the first ruling princes at the conference at Dolon-Nuur (42°N, 116°E: with which began the official and legal subjection of the Halha Mongolian princes) in the year 1691, the new division of the Aimag into Hoshuu was completed. The Manchurians however meant by the term Hoshuu the Manchurian military-administrative unit 'Banner' (Manch. gusa) in Mongolia. Afterwards the number of Hoshuu increased. In the year 1725 there were already seventy-five and in the year 1755 eighty-four Hoshuu were registered. As well, in 1725 a new fourth Aimag, Sain Noion Khan, was founded.

3 The oldest Mongolian maps known to us today are two maps referred to as Renat maps which the Swedish prisoner of war Johan Gustav Renat brought back to Sweden after serving with the prince of the Jungar (the West Mongolian kingdom 1636-1755), Galdan Cerin (ruled 1727-1745) (Poppe, 157-59). These maps were drawn in 1739 in order to settle region disputes of the prince of the West Mongolian Ordos League. The bulk of historical Mongolian maps come, however, from the 19th century. There are 335 maps of the Hoshuu pasture regions of Mongolia, which were produced from about 1850 until the 1920's, in the State Library as well as in the State Central Archive for History in Ulan Bator. In the second half of the 19th century there were around a hundred Hoshuus. All Hoshuu are numerously mapped because almost all Hoshuu territories were remapped with or without changes after each new appointment of the governing Hoshuu princes. The State Library of Marburg possesses by the way 182 maps collected by H. Consten and W. Heissig (Heissig 1944; Haltod 1966), which represent a large portion of the settled regions of Mongolia in the 19th century. The Library of the Tenri University of Japan keeps a further 44 maps of predominately Inner Mongolian regions which correspond with the respective maps of the Marburg collection. All maps represent a bird's-eye view of the respective regions, in particular of the pasture regions. Despite a certain standardising of the map drawing a real image of the countryside prevails on most of the maps. As borderlines of definite region mountains, rivers and stone heaps are frequently used on the maps. The rivers are depicted by blue or brown-yellow wavy lines, the dried out beds are drawn white, mountains are brown-red or covered with vegetation, clearly elaborated trees and bushes.

4 Aimag: This word underwent many changes of meaning in the course of history. In ancient times the Aimag was essentially a tribal and familial grouping and afterwards, until the 19th century in West Mongolia, until 1691 in East Mongolia, a territorial unit bound by a tribal federation. After the Manchurian conquest the Aimag became with the establishment of the Banner policy a territorial administration unit. Today there are 18 Aimags and 3 Aimag-level cities.

The vast majority of the newly founded units was formed by the pasture, livestock and subject property of the high clergy, Otog (property of rJe-btsun dam-pa Hutagt) and Shav' (property of the second most senior high clergy Hutagt with Seal), which administratively resembled the Hoshuu. There were besides other forms of Otog and Bag ownership which existed within a Hoshuu. They enjoyed a status of autonomy within the Hoshuu government, which manifested itself especially in the facts that the pasture region, Otog, could only be used by Shav' subjects of the clergy and that these subjects needed not perform administrative service in the Hoshuu government. According to statistics from 1918, the rJe-btsun dam-pa Hutagt (the religious and state head of Mongolia 1911-1924) had altogether 198 Otog and Bag. Most of these were not independent territorial-administrative units, rather ownership of pasture land, livestock and subjects within the Hoshuu.

With the territorial-administrative changes after the release of Mongolia from Manchurian rule in 1911 127 Hoshuu and similar administrative divisions were determined: namely all together 115 Hoshuu and 12 independent Otog and Shav' (Shirendiv et al. 1968: 445–46).

All this resulted in the livestock keepers quarreling with one another on account of the deficit of necessary natural area for the seasonal pasture ways.

The State Central Archive for History and the State Library in Ulan Bator preserve a vast number of complaint charges of normal livestock keepers against members of the nobility and of members of the nobility against one another, not only within a single Hoshuu but also amongst Hoshuu, concerning the illegal confiscation of pasture region acquired by generations of tradition. They prove that the disputes about pasture land had intensified in particular from the second half of the 19th century. Most of the disputes arose, in those Hoshuu whose borders did not correspond with the natural strips which normally contain ecologically optimal regions sufficient for the four seasonal pasture ways. The majority of these Hoshuu had been formed by imperial command.

After the People's Revolution of 1921 territorial-adminstrative reorganisation measures were carried out on a large scale in the twenties, the start of the thirties and the sixties.

adminis At the start of the twenties several old Hoshuu were dissolved as a result of the trative renewal policy of the recently founded People's Government. Through this the number of Hoshuu was reduced to ninety-three (Mongolische Landeskarte 1926). For example the above mentioned Shav' and Otog were thereby dissolved: some were returned to the respective Hoshuu from which they had derived, others were converted into independent Hoshuu (Istoriya Mongolskoi ... 1983: 354). This structure thus resembled the situation of the Hoshuu existed in the middle of the 18th century, that is when there were still eighty-four Hoshuu. One sees here that the geographical locations of the Hoshuu are closely connected with the altitude conditions (map 2). This means that the degree of correspondence between the possibility of pasture land use according to seasonal needs and the territorial-administrative divisions was still rational.

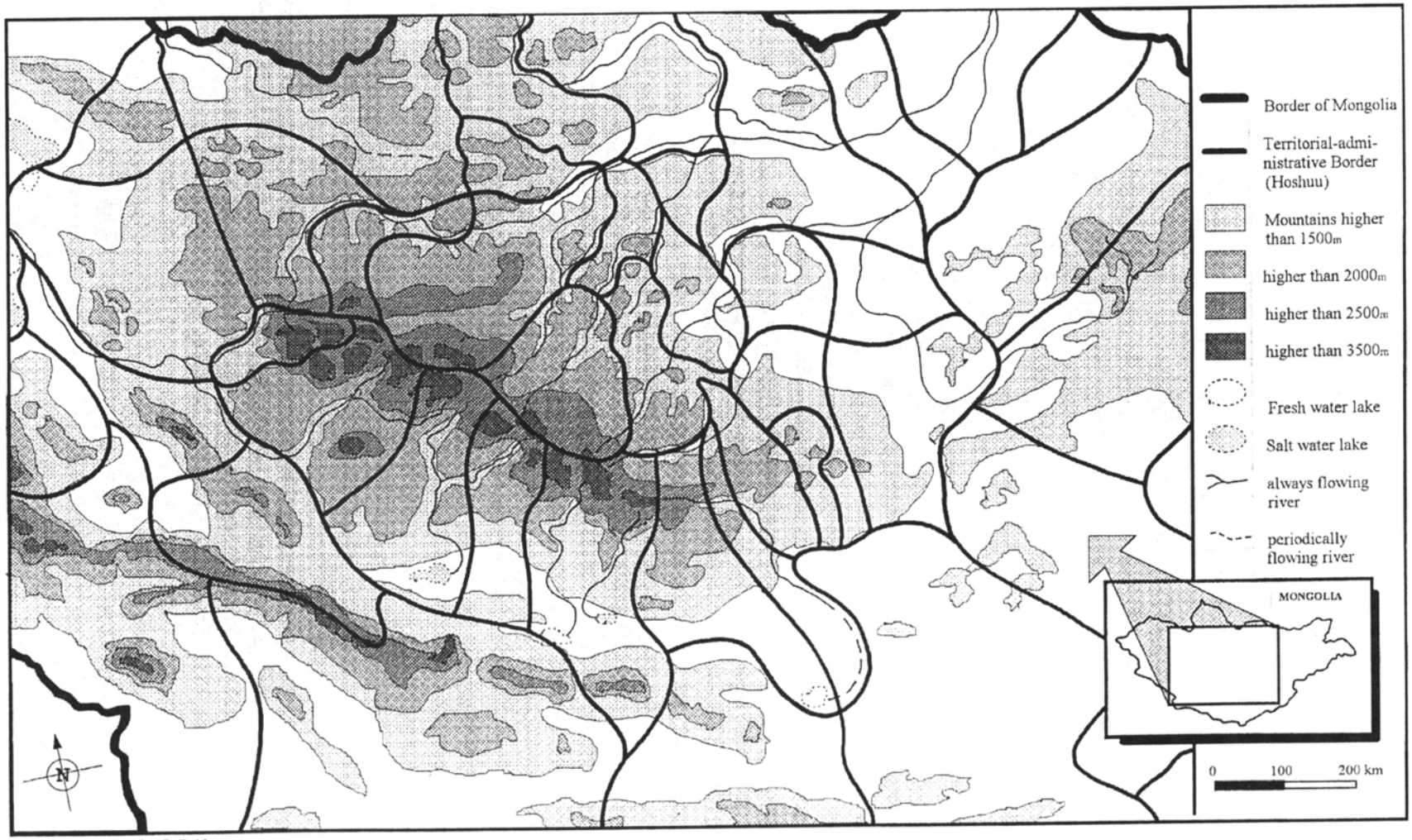
The further territorial-administrative reorganisation policy of the thirties was oriented so as to dissolve as quickly as possible the old system and to build up a controlled revolutionary dictatorship over the expanded population of the country.

To this end a new administration structure was established. The old term Hoshuu was replaced by the term Sum, which originally had been used for the administrative sub-unit within the Hoshuu.

But the number of territorial-administrative units became again more and more. 1925 there were 6 Aimag including 96 Hoshuus. 1931 – 13 Aimag including more than hundred Sums, and after the reogranisation in the sixtieth they became 18 Aimag covering 360 Sums. They had a direct connection with the cooperative movement of the fifties. As the result of the forced politics of livestock breeding families into economic cooperatives, Negdel, in the fifties were established 675 cooperatives, which comprised 99.3% of all households. On account of the improvement in economic potential the cooperatives were then brought together or enlarged, and their number thereby decreased in 1959 to 389, and at the end of sixtieth to 255. There were established 55 state agricultural and fodder enterprises. In order to optimise the economic and administrative organisation of rural regions these 310 economic units have been organised territorial-administratively as a Sums (255 Sum-Negdel, 51 Sum as property of the state and 4 Sum as production of fodder enterprises).

Same times the disputes amongst livestock keepers concerning the natural area for the required seasonal pasturage were thereby intensified on account of the borders which had been drawn up without

Map 2. The relief conditions of the *Hoshuu* Territories (1926) in the vicinity of the *Hangai* Mountains



Design and cartography: B. Bold

consideration for the wholeness of the ecologically appropriate pasture regions. These complaints were controlled by administrative means. It was much worse as cooperatives were reorganised into 870 Bag (or Brigad) and about 33,629 Suur' (Onuki 1990: 65) as a sub-units within cooperatives and were in practice shared pastures in very close-meshed form. This enabled the state to more easily economically and administratively manage the country and the nomadic population expanding over its huge territory. The error in this policy was rooted in the fact that one did not consider the indivisibility of the pasture strips necessary for the seasonal pasturage, which are located according to geographical relief conditions and exposure related climatic, vegetative etc. differences. For this reason the correspondence of the heterogeneous ecological backgrounds of the seasonal pasture regions and the territorial-administrative units adapted to them was lost due to the existence of too many Sum (map 3). I would like to cite here an example which makes clear the consequence of this contradiction. The present location of the Ugii-Nuur Sum of the Arhangai-Aimag was before and after the People's Revolution a point of intersection of the then three to five Hoshuu borders (map 3*). At this location livestock keepers from the respective Hoshuu earlier carried out in principle only the summer and fall pasturage, since the region is ecologically appropriate for these seasons. Thus the newly created Sum had no pasture region for the winter and spring. The Ugii-Nuur Sum therefore experienced since its establishment in 1961 often high animal and in particular calf losses on account of the lack of fodder in winter and spring. In 1983 it was the Sum which had lost the most calves. Since then in the Ugii-Nuur Sum seven Sum-Negdel directors have been dismissed from office due to so called irresponsibility.

Nevertheless, there have been many instances of seasonal grazing migrations. Livestock keeper often crossed the territorial border lines of their residential Aimag and Sum into other areas seeking essential pasture land (eg. Müller et al. 1996: 45).

If the seasonal pasture regions lie linearly from mountains into lowlands, the territories of the Sum in most cases are not situated on the lines. For example of the above 255 Sum-Negdel about 60 are situated in the high mountain regions, about 40 in the mountain forest regions, about 60 in the steppes, about 40 in the basins of the large lakes and about 60 in the Gobi region (Batnasan 1978: 57). Over and above this it is not unusual for the entire territory of an Aimag to be an ecologically homogeneous zone. That demonstrate that on account of the last re-division of the pasture land, which had been introduced from the government, the equilibrium between the necessity of ecologically differing pasture regions for seasonal migrations and the possibility of pasture land use within the allocated Sum territories according to the methods of seasonal migration has been critically disturbed (map 4).

In the collective system the loss of the seasonal pastures had been compensated for partly by additional hay. With the abolishment of the collective-economic system and the privatisation of animals owned by the collectives in the early 1990s the problem of regulating the use of pasture land remained unresolved. Subsequently the situation deteriorated. Thus, mainly for this reason, today uncontrolled grazing can be observed everywhere.

Mongolian specialists estimate that around 30% of the pastoral lands are so badly over-grazed that the meagre humus layer is now exposed to a very great amount of wind and water erosion. According to the evaluation, 41.3% of total pastoral land is damaged and/or sand-silted and of that, 4% strongly so, 20% moderately, and approximately 70% lightly so (Ölziibat 1997). Ecological damage to pastures under the cold, arid conditions of the Mongolian steppes and deserts takes a long time to repair - if it can be done at all.

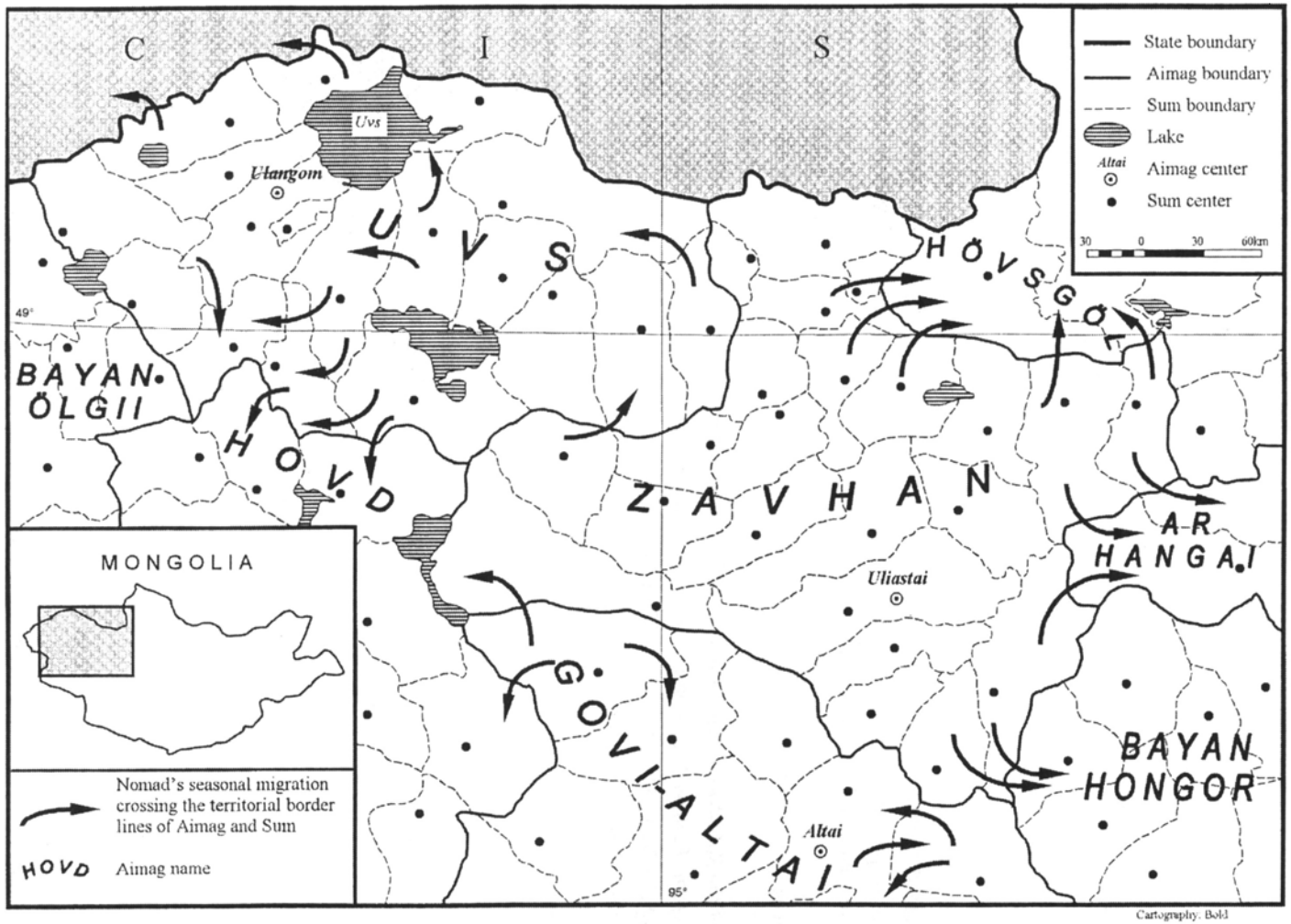
Nevertheless, since private stocks are quickly increasing, irregular utilisation has already started leading to serious problems of exceeding the carrying capacity and to the spoiling of the pastures, especially around urban areas where more livestock-breeders concentrate due to favourable sales prospects for animals and animal products. The negative impacts of high concentration of livestock combined with reduced spatial mobility which can arise for the natural environment as well as for the quality and the state of health of the animals are well known.

As mentioned above, in the pastoral land of Mongolia (84% of the total land and 98% of the agricultural-effective land) nearly 50 million tons of fodder is grown annually. When converted into 'sheep units' (1 horse, or cattle or yak equals 7 sheep; 1 camel equals 10,5 sheep; 1 goat equals 0,7

Map 3. The relief conditions of the *Sum* Territories (1989) in the vicinity of the *Hangai* Mountains

Design and cartography: B. Bold

Map 4. Pastoral migration crossing the territorial border lines of Aimag and Sum in the 70s and 80s



Source: Govi-Altai aimgiin hörsnii sudalgaany tailbar bichig, 1991, Gazryn bodlogyn hüreelen, Ulaanbaatar, p. 57ff.
Graivoronskii, V. V., 1979, Ot kochevogo obraza jizni k osedlosti, Moscow, p. 115ff.

sheep) this is equal to the annual fodder needs of approximately 60 million 'sheep'. If one considers the average numerical ratios of the traditional five types of animal (camel, horse, cow/yak, sheep, goat) this means 22 million mixed species. But today we have, in sheep units, about 67 million sheep namely 30,2 [5] million mixed species in the country (Bold et al. 1999). All this clearly shows that the limits of the carrying capacity of pastoral land have already been exceeded – by having too many animals.

The vast majority of the present territorial-administrative divisions, which have more or less interfered with the availability of pasture regions for the migrations necessary for a four seasonal pasturage, must be reorganised. For example, many territorial-administrative Sum divisions should be brought together into larger regions taking the pasture regions into special consideration. Here both historical-practical experience as well as the results of ecological-economic studies concerning regionalisation of the pasture regions are worthy of consideration. This will be not only the most important prerequisites for the effective use of the pasture land and for an increase in the productivity of the nomadic livestock economy which is fully dependent upon the natural pasture, but only through this it will be possible to combat the latent process of desertification and conserve and rehabilitate vegetative cover, soils and water resources.

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[5] At the end of the 1998 the total livestock figure was 32,897,500 per head. The reason for the difference between the end of 1998 and end of 2000 livestock number is the drop in stocks, more than 3 million, due to the last two winters and the subsequent springs which were particularly hard (see Appendix).

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APPENDIX

'Old World Dry Belt' (OWDB) Zone: Mongolia – Asia – Africa: land and number of livestock

	Total territory in *ha*	Potential pasture land in *ha*	Number of livestock in thousands (1992)				
			Camels	Horses	Cattles	Sheep	Goats
Mongolia	156.650	155.254	415	2.200	2.819	14.657	5.602
Asian countries of OWDB	1.995.739	1.762.711	2.830	13.807	143.479	335.491	184.971
African countries of OWDB	1.658.401	1.553.975	11.717	408.1	108.963	148.151	118.086

Source:

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(FAO (1993): Production Yearbook 1992, Vol. 46)

Mongolia: population and livestock owner

	Total population in thousands	Rural population in thousands	Herdsmen's households	Herdsmen
1989	2095.6	902.0	68.963	135.420
2000	2407.5	1030.5	191.526	421.392

Source:

National Statistical Office of Mongolia. Mongolian Statistical Yearbook, 2000, Ulaanbaatar 2001.

Mongolia: number of livestock in thousands

	Total	Camels	Horses	Cattles	Sheep	Goats
ca. 1220	±15 200.0 (1)	400.0	1400.0	1400.0	9000.0	3000.0
1918	9 645.6 (2)	228.7	1150.5	1078.4	5700.1	1487.9
1940	26 204.8 (3)	643.4	2358.1	2722.8	15 384.2	5096.3
1941–1993	± 22–25million	-	-	-	-	-
1998	32 897.5 (4)	356.5	3059.1	3725.8	14 694.2	11 061.9
2000	30 227.5 (4)	322.9	2660.7	3097.6	13 876.4	10 269.8

Sources:

1 Bold, B.-O., 1998a

2 The first official quantity of stock can be determined only after the count of 1918. There are reports in official files and in historical chronicles that animal counts were carried out in the eighteenth century and especially in the nineteenth century, but the results of these have only in part been preserved (Maiskii: 122–23).

3 This is the record number of stock of animals of Mongolia until 1994 (Source: 4).

4 National Statistical Office of Mongolia. Mongolian Statistical Yearbook, 2000, Ulaanbaatar 2001, pp. 118.